

# PURE METALS, ALL YS, CERMETS, COMPOSITES AND BLENDS

## COBALT BASE POWDERS

POWDER TYPE	PRODUCT	NOMINAL PARTICLE SIZE AND/OR SPECIFICATION	TYPICAL PROPERTIES AND APPLICATIONS
Co 25.5Cr 10.5Ni 7.5W 0.5C Water Atomized	Metco 45C-NS	-75 + 45 $\mu\text{m}$ (-200 +325 mesh) CPW 218 MSRR 9507/3 PWA 1318 SNECMA DMR 33.007	<ul style="list-style-type: none"> <li>Resists wear by abrasive grains, hard surfaces, fretting and particle erosion in high temperature environments between 540-840° C (1000-1550° F)</li> </ul>
	Metco 45VF-NS	-45 + 5 $\mu\text{m}$ (-325 mesh +5 $\mu\text{m}$ ) CP 6002 CPW 236 Lycoming M3963 MSRR 9507/23 PWA 1316 SNECMA DMR 33.008 (supplied on a lot select basis only) Volvo PM 819-16	
Co 25.5Cr 10.5Ni 7.5W .5C Spheroidal, Gas Atomized	AMDRY X40	-106 +37 $\mu\text{m}$ (-140 +400 mesh) GE B50TF185, Class A	<ul style="list-style-type: none"> <li>Primarily used for surface restoration of worn or damaged parts, e.g. airfoils, combustors, blades and vanes in the gas turbine industry</li> </ul>
Co 24Cr 10Ni 7W 3.5Ta .6C Spheroidal, Gas Atomized	AMDRY MM509	-45 + 5 $\mu\text{m}$ (-325 mesh +5 $\mu\text{m}$ ) Howmet MS 1068 PWA 1185-2	<ul style="list-style-type: none"> <li>This material can be utilized as an Active Diffusion Alloy if mixed with another Active Diffusion material (see Active Diffusion Section).</li> </ul>
Co 32Ni 21Cr 8Al 0.5Y Spheroidal, Gas Atomized	AMDRY 995C	-75 +45 $\mu\text{m}$ (-200 +325 mesh) Allied Signal EMS 57741, Grade A MSRR 9507/47; MSRR 9507/73 Turbomeca LA 657 PE1 Ind. 0 Volvo PM 819-58	<ul style="list-style-type: none"> <li>For demanding aerospace applications, these powders are usually sprayed by VPS/LPPS and subsequently heat treated to produce dense, high quality coatings</li> <li>The coarser size ranges can also be sprayed by air plasma</li> <li>AMDRY CoCrAlY and CoNiCrAlY alloys are used for protective plasma spray coatings in hot corrosive or oxidizing environments up to approximately 850° C (1560° F) for the APS coatings and approximately 1050° C (1920° F) for the heat treated VPS coatings</li> <li>AMDRY 9954 is suitable for HVOF</li> </ul>
	AMDRY 995I	-37 + 5 $\mu\text{m}$ (-400 mesh + 5 $\mu\text{m}$ ) MSRR 9537/1 SNECMA DMR 33.095	
	AMDRY 9954	-62 + 11 $\mu\text{m}$ Allied Signal EMS 57741, Grade B GE B50TF195, Class A Howmet CD 1128	
Co 28Mo 8Cr 2Si (Similar to Tribaloy® 400)* Water Atomized	Metco 66F-NS	-45 +15 $\mu\text{m}$ (-325 mesh +15 $\mu\text{m}$ ) Allied Signal EMS 52432, Class XVI Allison EMS 5671 GE B50TF155, Class A	<ul style="list-style-type: none"> <li>Coatings perform well in reducing environments such as hydrochloric, formic and sulfuric acids; oxidizing environments, such as ferric chloride non-oxidizing environments, such as ferric chloride and nitric acid; and non-oxidizing environments, such as phosphoric and acetic acid and salt water</li> </ul>
Co 28Mo 8Cr 2Si (Similar to Tribaloy® 400)* Spheroidal, Gas Atomized	Diamalloy 3002NS	-45 +5.5 $\mu\text{m}$ (-325 mesh +5.5 $\mu\text{m}$ )	<ul style="list-style-type: none"> <li>Particularly suitable where lubrication is low or non-existent</li> <li>Excellent sliding wear resistance combined with good hot corrosion resistance and moderate oxidation resistance, at temperatures up to approximately 800° C (1470° F)</li> </ul>
Co 28Mo 17Cr 3Si (Similar to Tribaloy® 800)* Gas Atomized	Metco 68F-NS-1	-45 +11 $\mu\text{m}$ (-325 mesh +11 $\mu\text{m}$ ) Allied Signal EMS 52432, Class. XV Allison EMS 56713 CFM Int'l CP 6021 GE B50TF190, Class A	
Co 28Mo 17Cr 3Si (Similar to Tribaloy® 800)* Gas Atomized	Diamalloy 3001	-45 +5.5 $\mu\text{m}$ (-325 mesh +5.5 $\mu\text{m}$ )	
Proprietary MCrAlY's Spheroidal, Gas Atomized	AMDRY 345	PWA 1348-2	<ul style="list-style-type: none"> <li>Used as hot corrosion and oxidation resistant bond coats, for example in the thermal barrier coating (TBC) system on turbine airfoils</li> </ul>
New! Proprietary MCrAlY's Available to OEM	Sulzer Metco 4195	B50AG5 (GT20)	<ul style="list-style-type: none"> <li>Proprietary alloys available to approved users</li> </ul>
	Sulzer Metco 4197	B50AG11 (GT29)	
	Sulzer Metco 4198	B50AG12 (GT33)	
	Sulzer Metco 4201	SICOAT 2231	

\*Tribaloy is a registered trademark of Deloro Stellite, Inc.

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# Material Certification

**SULZER**

Sulzer Metco Inc.  
1101 Prospect Avenue  
Westbury, NY 11590  
Phone: +1 516 334 1300  
Fax: +1 516 338 2477

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08/01/03

**HICKHAM INDUSTRIES INC.****11518 OLD LAPORTE RD  
LAPORTE TX 77571****AMDRY 365-2****Powder****Lot No. 330357**

Customer PO 145259-9915 Control No.

Quantity 20 lbs  
Date 8/03**Chemical Analysis**

	<b>Method</b>	<b>Results, wt%</b>
Al	ICP	12.80
Bi(ppm)	GFAA	<0.2
C	Combustion	0.01
Co	ICP	23.31
Cr	ICP	17.44
Ni	Balance	45.64
Pb(ppm)	GFAA	<1
Y	ICP	0.60
T.A.O.	ICP	<0.20

**Particle Size, microns**

+30um	MICROTRAC	100.00
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**Sieve Analysis**

+200	ASTM B214	0
+325		79
-170	ASTM B214	100
-325	ASTM B214	21
-400	ASTM B214	2

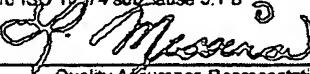
**Approved Specifications:**

PWA1365-2revN;CPW387C;PM819-51iss9

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It is hereby certified that the material described above has been inspected, tested and unless otherwise stated, conforms to all applicable requirements of the contract order and specifications referenced on this certificate. This material is being supplied in accordance with the Quality System at Sulzer Metco (US) Inc. which is an ISO 9001 Certified Vendor and a NADCAP Accredited Materials Test Laboratory. This inspection certificate meets the requirements of International Standard ISO 10074 subclause 3.1 B

By



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Quality Assurance Representative



ISO 9001  
Certificate N .59136A

NADCAP Approved  
Materials Testing Laboratories



# Material Certification



Sulzer Metco Inc.  
1101 Prepool Avenue  
Woolbury, NY 11600  
Phone: +1 516 334 1300  
Fax: +1 516 338 2477

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04/25/03

Hickman Industries Inc.  
Bldg. 1  
11618 Old LaPorto Rd.  
LaPorto, TX 77571

Product:	Sulzer Metco 2460NS Powder
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Batch No.	W69182
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Customer PO	143644-00189	Control	1107196	Quantity	10.0 Lbs.
				Date	4/17/03

## Chemical Analysis

	Method	Results, w/w%
Al2O3	XRF	0.00
Fe2O3	XRF	0.02
HfO2	XRF	1.89
MgO	XRF	0.01
SiO2	XRF	0.33
TiO2	XRF	0.02
Y2O3	XRF	7.45
ZrO2	Balance	84.33
TAO	XRF	0.50
Organics	Gravimetric	4.04
Polyester	Gravimetric	3.18
U&Th	XRF	0.02

## Particle Size, microns

-176um	ASTM B822	100.0
-125um	Microtrac	90.0
-88um		83.8
-62um		53.0
-44um		18.2
-31um		8.4
-22um		1.8
-18um		0.4

## Other Tests

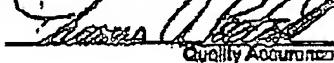
Density	ASTM B417	1.0
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## Approved Specification(s)

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It is hereby certified that the material described above has been inspected, tested and unless otherwise stated, conforms to all applicable requirements of the contract order and specifications referenced on this certificate. This material is being supplied in accordance with the Quality System of Sulzer Metco (USA) Inc. which is an ISO 9001 Certified Vendor and a NADCAP Accredited Materials Test Laboratory. This inspection certificate meets the requirements of International Standard ISO 10614 subclause 5.1 B.

By



Quality Assurance Representative



ISO 9001  
Certification No. 00198A

NADCAP Approved  
Materials Testing Laboratories



# H.C. Starck



Abnahmeprüfzeugnis 3.1.B

Inspection Certificate 3.1.B

gemäß/von EN 10204

H.C. Starck GmbH

Postfach 2540  
D-36915 Goslar  
Telefon 05321/751-0

Datum/Date 29.07.2002

Kunde/Customer

H. C. Starck Inc.  
Newton

Produkt/Product

AMPERIT® 827.774  
ZrO<sub>2</sub>-Y<sub>2</sub>O<sub>3</sub> 93-7 aggl., sint.  
per G.E. A50TF278, Class C Is. S4, dtd. 04/25/00

Ihre Bestell-Nr. vom/Your Order No. Dated  
903291 29.07.02

Unsere Auftrags-Nr./Our Order No.

88318/1 Fischer/Hinsemann

Liefermenge/ Quantity Delivered

10 / 65

Lot-Nr./Lot No.

50721

Analysenergebnisse/Analytical Results

Analysenergebnisse nach vorschriftsmäßiger Probenahme und Prüfung/Analytical results by specified sampling and testing

Chemical analysis

Specification

			Min.	Max.	
Y <sub>2</sub> O <sub>3</sub>	7,87	%	7,0	9,0	%
Al <sub>2</sub> O <sub>3</sub>	0,16	%		0,7	%
SiO <sub>2</sub>	0,12	%		1,5	%
TiO <sub>2</sub>	0,08	%		0,5	%
Fe <sub>2</sub> O <sub>3</sub>	0,02	%		0,5	%
HfO <sub>2</sub>	1,77	%		2,5	%
U+Th	0,04	%		0,05	%
Total other Impurities <sup>1</sup>	< 0,10	%		1,5	%
ZrO <sub>2</sub>	balance		balance		

Rotap Sieve Analysis per ASTM B-214 US-Standard Sieve

+140 mesh	1,8	%		7,0	%
-140+200 mesh	9,4	%		35,0	%
-200+325 mesh	40,8	%	15,0		%
-325 mesh	48,0	%		57,0	%

<sup>1</sup> = CaO + MgO

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Bemerkungen/Remarks

Always mix well before using.  
Chemical and physical analysis were performed at H. C. Starck's  
laboratories which are GE approved under certification S-400.

Factory expert J. Möller QMB Goslar Plant